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SUBJECT: USAF Satellite Test Center Advanced Data Subsystem - Case 105-3

DATE: February 18, 1969

FROM: J. H. Fox



MEMORANDUM FOR FILE

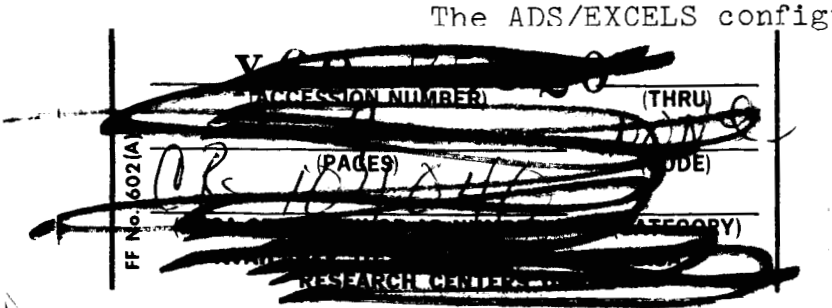
The USAF Satellite Test Center (STC) has undergone an evolutionary growth in capability during the past ten years. Beginning with a single satellite capability in 1958 this facility, now operating with its second generation of equipment, has grown in capability such that dozens of satellites are now controlled through the use of common, time-shared resources. Tracking stations (antennae, telemetry ground stations), communications lines and equipment, computers, control and analysis rooms (consoles, printers, display devices) are centrally scheduled and shared by all programs.

A third generation of equipment is now being installed. This Advanced Data Subsystem (ADS) together with an Expanded Electronics and Communications Subsystem (EXCELS) was initially designed to handle the increasing satellite population, including the Manned Orbiting Laboratory (MOL), programmed for the next five to seven years. Figure 1 shows the basic functional concept employed by the STC; figure 2 shows the current arrangement of the data subsystem; figure 3 shows the ADS as originally conceived and figure 4 shows the operational concept to be employed in the ADS/EXCELS era.

Several factors (primarily costs and slipping ADS schedules) have caused the ADS configuration to be altered from the original concept. Initially, at least, the MOL program will be the first tenant of a new building being built to house the ADS/EXCELS equipment as well as up to ten new Mission Control Centers. These Mission Control Centers will be constructed in modular form to provide flexibility. The basic unit will be a 30 ft. x 30 ft. module. Walls will be non-load-bearing and removable so that the control center size can be adjusted according to the program requirement. Although a final decision has not yet been reached, it appears that two CDC 6600 computers (one prime, one backup) will be used by MOL in lieu of the CDC 3800 computers shown in Figure 3. The CDC 3800 will remain in the present data systems building to continue to handle non-MOL work.

The ADS/EXCELS configuration has as design goals:

o handle more satellite data;



2. improved availability of equipment through reduction in tracking station turnaround times,* on-line fault detection, certain equipment redundancy, and graceful degradation or "fail soft" features in the software, and;

3. improved cost effectiveness through direct user access and control of the system and "roll-in/roll-out" maintenance of equipment such as printers and consoles.

The operating concept provides for direct access to the central data bank from any of the major functional groups (network control, mission control, data system operations, communications and spacecraft analysis) by means of various entry devices (alphanumeric keyboards, fixed function keyboards, paged-overlay keyboards, light pens). Data are presented via high-speed printers and cathode ray tubes (CRT's). Control over the total system, including tracking stations is exercised by two functional organizations--by network control from a Network Control Center and by any of the several mission control groups from any number of Mission Control Centers. Network control is concerned with network (resource) scheduling, conflict resolution, outage reporting, maintenance control, configuration control, communications control, data system control, and inter-agency, inter-range and recovery force liaison. Because of the many spacecraft to be supported with fixed resources, scheduling and conflict resolution have become the two most critical activities performed by network control. Each Mission Control Center has complete control over network resources assigned it during the period scheduled. These periods range from less than ten minutes for low altitude satellite passes to several hours for high altitude satellites. Upon completion of the pass, all network resources (communications lines, buffer computers, telemetry ground stations, antennae, etc.) are returned to network control for rescheduling to another program.

J. H. Fox

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Attachments
Figures 1-4

*Design goal is one minute satellite-to-satellite using the Space Ground Link Subsystem (SGLS).

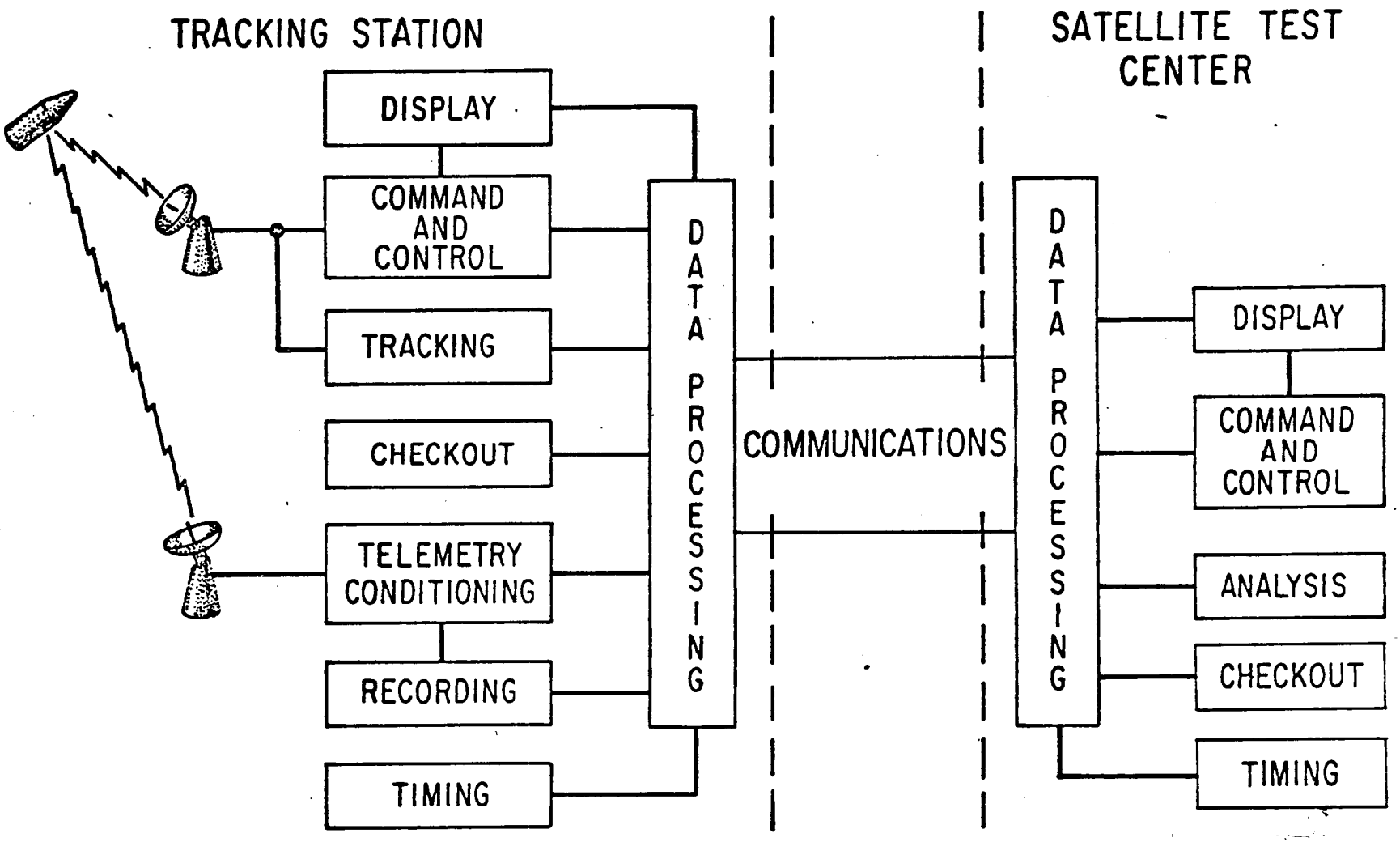



FIGURE 1 - FUNCTIONAL CONCEPT

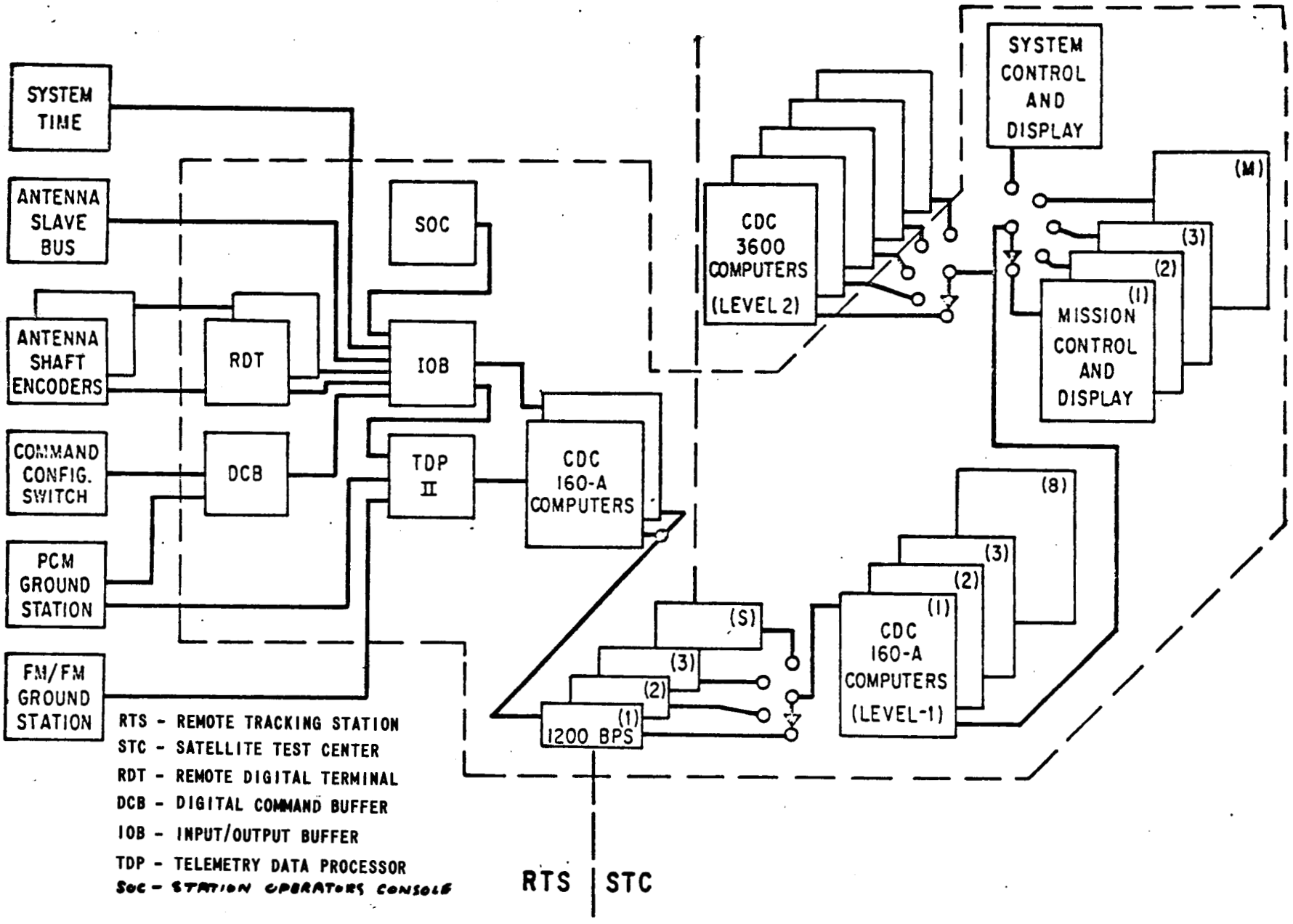



FIGURE 2 - CURRENT DATA SUB-SYSTEM

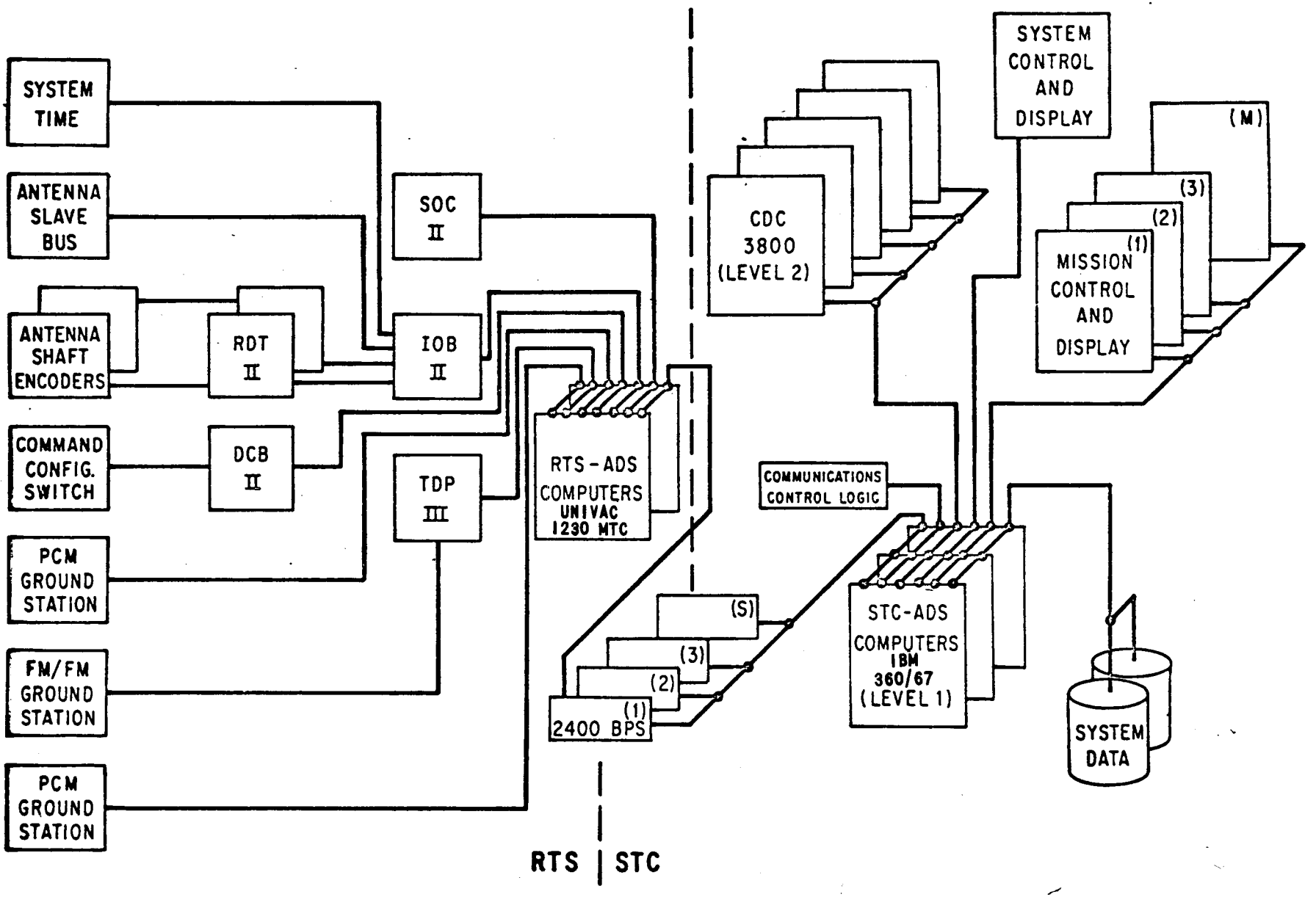
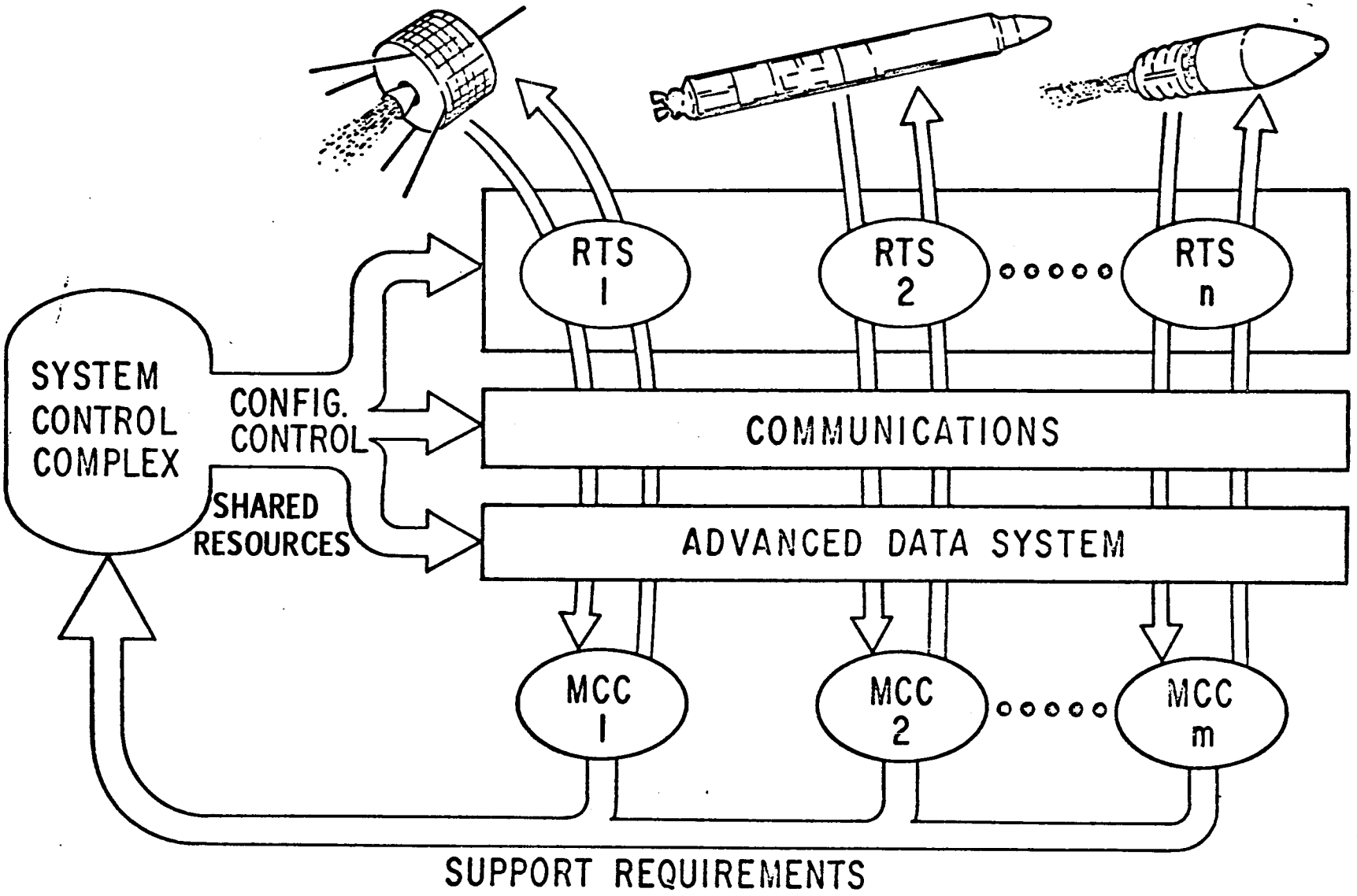



FIGURE 3 - ADVANCED DATA SUB-SYSTEM




RTS - REMOTE TRACKING STATIONS
MCC - MISSION CONTROL CENTER

FIGURE 4 - SHARED RESOURCE OPERATIONAL CONCEPT

**Bellcomm, Inc.**

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